(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－343406
（P2002－343406A）
(43)公開日　平成14年11月29日(2002.11.29)

(51)Int.Cl.[7]	識別記号	ＦＩ		テーマコード(参考)
Ｈ０１Ｍ　8/24		Ｈ０１Ｍ　8/24	Ｒ	5Ｈ０２６
			Ｓ	
8/10		8/10		

審査請求　未請求　請求項の数３　ＯＬ　（全７頁）

(21)出願番号　特願2001－146634(P2001－146634)

(22)出願日　平成13年５月16日(2001.5.16)

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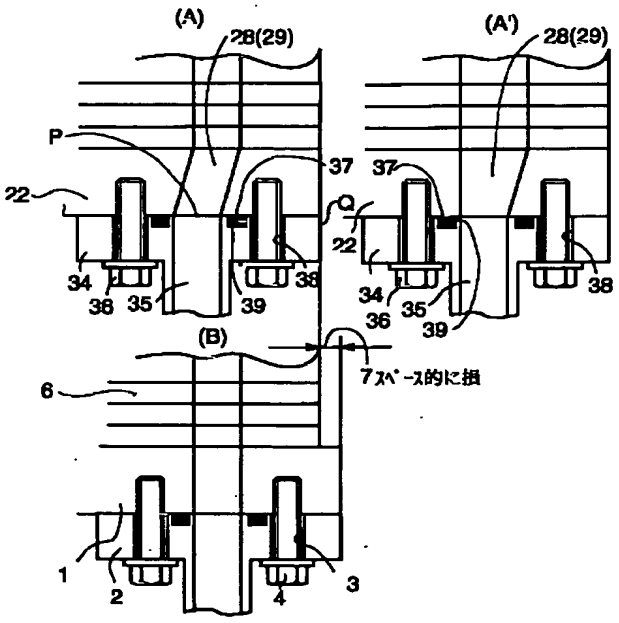
Ｆターム(参考)　5H026 AA06 CC03 CC08

(54)【発明の名称】　燃料電池のマニホールド

(57)【要約】
【課題】　省スペース化とシール性の両方を共に達成できる燃料電池のマニホールドの提供。
【解決手段】　（１）セル積層体の両端にエンドプレート２２を配して構成しスタック２３内に形成された流体のマニホールド２８、２９と、フランジ３４を有しフランジ部でスタック２３の一端のエンドプレート２２にボルト締結された配管３０、３１内に形成されスタック内のマニホールドに連通する流体流路３５と、からなる燃料電池のマニホールドであって、スタック内のマニホールド２８、２９のうち、スタック一端のエンドプレート２２内のマニホールド部分は、セル積層方向に対して斜めに延びている燃料電池のマニホールド。（２）アノードガスと他の流体とで、Ｏリングで構成されるシールラインは互いに独立とするが、Ｏリングを押さえる配管フランジ３４は互いに共通にした燃料電池のマニホールド。



【特許請求の範囲】
【請求項１】　セル積層体の両端にエンドプレートを配して構成したスタック内に形成された流体のマニホールドと、
フランジを有し該フランジ部で前記スタックの一端のエンドプレートにボルト締結された配管内に形成され前記スタック内のマニホールドに連通する流体流路と、からなる燃料電池のマニホールドであって、前記スタック内のマニホールドのうち、前記スタック一端のエンドプレート内のマニホールド部分は、セル積層方向に対して斜めに延びている燃料電池のマニホールド。
【請求項２】　前記配管のフランジ部分の流体流路の中心は前記スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしている請求項１記載の燃料電池のマニホールド。
【請求項３】　前記配管の前記スタックへの接続部で、アノードガスと他の流体とで、Ｏリングで構成されるシールラインは互いに独立とするが、前記Ｏリングを押さえる配管フランジは互いに共通にした請求項１記載の燃料電池のマニホールド。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、燃料電池のマニホールドに関し、とくに燃料電池スタック内のマニホールドとスタック外の配管内流路との接続部およびその近傍の構造に関する。
【０００２】
【従来の技術】固体高分子電解質型燃料電池は、イオン交換膜からなる電解質膜とこの電解質膜の一面に配置された触媒層および拡散層からなる電極（アノード、燃料極）および電解質膜の他面に配置された触媒層および拡散層からなる電極（カソード、空気極）とからなる膜－電極アッセンブリ（ＭＥＡ：Membrane-Electrode Assembly）と、アノード、カソードに燃料ガス（アノードガス、水素）および酸化ガス（カソードガス、酸素、通常は空気）を供給するための流体通路を形成するセパレータとからセルを構成し、複数のセルを積層してモジュールとし、モジュールを積層してモジュール群を構成し、モジュール群のセル積層方向両端に、ターミナル、インシュレータ、エンドプレートを配置してスタックを構成し、スタックをスタックの外側でセル積層体積層方向に延びる締結部材（たとえば、テンションプレート）にて締め付け、固定したものからなる。固体高分子電解質型燃料電池では、アノード側で、水素が水素イオンと電子にされ、水素イオンは電解質膜中をカソード側に移動し、カソード側で酸素と水素イオンおよび電子（隣りのＭＥＡのアノードで生成した電子がセパレータを通してくる）から水が生成される。
アノード側：$H_2 \rightarrow 2H^+ + 2e^-$
カソード側：$2H^+ + 2e^- + (1/2)O_2 \rightarrow H_2O$
ジュール熱およびカソードでの水生成反応で出る熱を冷却するために、セパレータ間には、各セル毎にあるいは複数個のセル毎に、冷却媒体（通常は冷却水）が流れる流路が形成されており、燃料電池を冷却している。上記の反応が正常に行われるように、燃料ガス、酸化ガス、冷媒等の流体が、スタック外の配管を通してスタック内の流体が流れるマニホールドに供給、排出される。特許第３０５０４０８号は、スタック外配管の、燃料電池スタックへの取付けおよびスタック内マニホールドへの接続構造を開示している。
【０００３】
【発明が解決しようとする課題】しかし、特許第３０５０４０８号のスタック外配管の燃料電池スタック内マニホールドへの接続構造では、エンドプレート内マニホールドを含むスタック内マニホールドとスタック外配管とが接続部とその近傍においてストレートに延びているので、スタック外配管にフランジを設けてスタック外配管をスタックのエンドプレートにボルト締結しようとすると、図５のＢ部に示した比較例に示すように、ボルト穴部３を設ける必要があるエンドプレート１のサイズが、ボルト穴部が設けられないセル積層体６の部分に比べて、ボルト穴部３を設けるスペース７分、セル積層方向と直交方向に不要に大きくなり、スペース的に無駄（損）が生じる。また、省スペース化をはかろうとしてフランジ２のＯリング５やボルト４を小さくしてＯリングやボルトを設けるスペースを小さくすると、配管フランジ部でのシール性が低下したり配管取付け強度が不足する。したがって、従来構造では、省スペース化とシール性の両方を共に達成することは困難であった。本発明の目的は、省スペース化とシール性の両方を共に達成できる燃料電池のマニホールドを提供することにある。
【０００４】
【課題を解決するための手段】上記目的を達成する本発明はつぎの通りである。
（１）　セル積層体の両端にエンドプレートを配して構成したスタック内に形成された流体のマニホールドと、フランジを有し該フランジ部で前記スタックの一端のエンドプレートにボルト締結された配管内に形成され前記スタック内のマニホールドに連通する流体流路と、からなる燃料電池のマニホールドであって、前記スタック内のマニホールドのうち、前記スタック一端のエンドプレート内のマニホールド部分は、セル積層方向に対して斜めに延びている燃料電池のマニホールド。
（２）　前記配管のフランジ部分の流体流路の中心は前記スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしている（１）記載の燃料電池のマニホールド。
（３）　前記配管の前記スタックへの接続部で、アノー

ドガスと他の流体とで、Oリングで構成されるシールラインは互いに独立とするが、前記Oリングを押さえる配管フランジは互いに共通にした（１）記載の燃料電池のマニホールド。

【０００５】上記（１）の燃料電池のマニホールドでは、スタック内のマニホールドのうち、前記スタック一端のエンドプレート内のマニホールド部分は、セル積層方向に対して斜めに延びているので、セル積層体部位のマニホールドの配置は従来のまま、エンドプレート内マニホールド部分と配管内流路との接続部をセル積層体部位のマニホールドに対してセル積層方向と直交する方向にオフセットさせることができ、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やOリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。上記（２）の燃料電池のマニホールドでは、配管のフランジ部分の流体流路の中心が、スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしているので、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やOリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。上記（３）の燃料電池のマニホールドでは、配管のスタックへの接続部で、アノードガスと他の流体とで、Oリングで構成されるシールラインは互いに独立とするが、Oリングを押さえる配管フランジは互いに共通にしたので、Oリングを通しての他流体の流路ラインへのアノードガスの透過防止を確保したまま、フランジを共有化することでフランジ部、シール部を省スペース化できる。

【０００６】

【発明の実施の形態】以下に、本発明の燃料電池を図１～図７を参照して、説明する。本発明の燃料電池１０は固体高分子電解質型燃料電池である。本発明の燃料電池１０は、たとえば燃料電池自動車に搭載される。ただし、自動車以外に用いられてもよい。

【０００７】固体高分子電解質型燃料電池１０は、図１、図２に示すように、イオン交換膜からなる電解質膜１１とこの電解質膜１１の一面に配置された触媒層１２および拡散層１３からなる電極１４（アノード、燃料極）および電解質膜１１の他面に配置された触媒層１５および拡散層１６からなる電極１７（カソード、空気極）とからなる膜－電極アッセンブリ（ＭＥＡ：Membrane-Electrode Assembly ）と、電極１４、１７に燃料ガス（アノードガス、水素）および酸化ガス（カソードガス、酸素、通常は空気）を供給するための流体通路２７（燃料ガス流路２７Ａ、酸化ガス流路２７Ｂ）および燃料電池冷却用の冷媒（冷却水）が流れる冷媒流路（冷却水流路）２６を形成するセパレータ１８とを重ねてセルを形成し、該セルを複数積層してモジュール１９とし、モジュール１９を積層してモジュール群を構成し、モジュール１９群のセル積層方向両端に、ターミナル２０、インシュレータ２１、エンドプレート２２を配置してスタック２３を構成し、スタック２３を積層方向に締め付けセル積層体の外側で燃料電池積層体積層方向に延びる締結部材２４（たとえば、テンションプレート、テンションプレートはスタック２３の一部）とボルト２５で固定したものからなる。冷媒流路２６はセル毎に、または複数のセル毎に、設けられる。たとえば、２つのセル毎に１つの冷媒流路２６が設けられる。

【０００８】セパレータ１８は、燃料ガスと酸化ガス、燃料ガスと冷却水、酸化ガスと冷却水、の何れかを互いに分離するとともに、隣り合うセルのアノードからカソードに電子が流れる電気の通路を形成している。セパレータ１８は、カーボン板に冷媒流路２６やガス流路２７（燃料ガス流路２７ａ、酸化ガス流路２７ｂ）を形成したもの、または、流路２６、２７を形成する凹凸のある金属板を複数枚重ね合わせたもの、または、導電製樹脂板（たとえば、導電材粒子を混入して導電性をもたせた樹脂板）に冷媒流路２６やガス流路２７を形成したもの、の何れかからなる。図示例はセパレータ１８がカーボン板からなる場合を示している。セル内ガス流路２７（燃料ガス流路２７ａ、酸化ガス流路２７ｂ）は、１本の溝状流路、または並行する複数本の溝状流路の群、または複数突起により隔てられた一対の板間の面状流路、の何れであってもよい。

【０００９】図３、図５、図６に示すように、燃料電池スタック２３内には、冷媒マニホールド２８が設けられており、冷媒マニホールド２８はセルの冷媒流路２６に連通している。冷媒は入側の冷媒マニホールド２８から冷媒流路２６に流れ、冷媒流路２６から出側の冷媒マニホールド２８に流れる。同様に、燃料電池スタック２３内には、ガスマニホールド２９が設けられており、ガスマニホールド２９は燃料ガスマニホールド２９ａと酸化ガスマニホールド２９ｂとからなる。燃料ガスマニホールド２９ａと酸化ガスマニホールド２９ｂは、それぞれ、セルの燃料ガス流路２７ａと酸化ガス流路２７ｂに連通している。燃料ガスは入側の燃料ガスマニホールド２９ａからセルの燃料ガス流路２７ａに流れ、燃料ガス流路２７ａから出側の燃料ガスマニホールド２９ａに流れる。酸化ガスは入側の酸化ガスマニホールド２９ｂからセルの酸化ガス流路２７ｂに流れ、酸化ガス流路２７ｂから出側の酸化ガスマニホールド２９ｂに流れる。

【００１０】スタック２３は２列並列に水平に配置され

てもよく、その場合は、スタック２３の両端のエンドプレート２２は、２列のスタック２３に対して共有される。スタック２３の一端にあるエンドプレート２２には、冷媒（冷却水）を燃料電池スタック２３内の冷媒マニホールド２８に供給・排出する冷媒配管３０が接続されており、反応ガスを燃料電池スタック内のガスマニホールド２９に供給・排出するガス配管３１が接続されている。ガス配管３１は、燃料ガスを燃料電池スタック内の燃料ガスマニホールド２９ａに供給・排出する燃料ガス配管３１ａと、酸化ガスを燃料電池スタック内の酸化ガスマニホールド２９ｂに供給・排出する酸化ガス配管３１ｂとからなる。冷媒、燃料ガス、酸化ガスは、スタック２３の一端にあるエンドプレート２２から燃料電池スタックに入り、Ｕターンして、同じエンドプレート２２から出る。

【００１１】１スタック燃料電池の場合、冷媒（冷却水）は入側冷媒配管３０からエンドプレート２２の左右方向端部の下部でスタック２３に入り、スタック２３からエンドプレート２２の左右方向端部の上部で出側冷媒配管３０に流出する。燃料ガスは、入側燃料ガス配管３１ａからエンドプレート２２の左右方向端部の上部でスタック２３に入り、スタック２３からエンドプレート２２の左右方向端部の下部で出側燃料ガス配管３１ａに流出する。酸化ガスは、入側酸化ガス配管３１ｂからエンドプレート２２の左右方向端部の下部でスタック２３に入り、スタック２３からエンドプレート２２の左右方向端部の上部で出側酸化ガス配管３１ｂに流出する。２スタック燃料電池の場合、上記の配管配置をとる１スタック燃料電池を２つ、入側、出側燃料ガス配管３１ａを中央側に配置して左右対称に配置し、エンドプレートは左右のスタックに対して共通に１つ設けた構造をとる。

【００１２】スタック２３の他端にあるエンドプレート２２の内側には、プレッシャプレート３２が設けられ、プレッシャプレート３２とエンドプレート２２との間にはスタック締め付け荷重の変動を吸収するばね機構（たとえば、皿ばね機構）３３が設けられる。スタック２３の他端にあるエンドプレート２２側には、冷媒、反応ガスの配管は接続されない。

【００１３】図３～図５に示すように、スタック２３内に形成された流体のマニホールド２８、２９と、フランジ３４を有しフランジ部でスタック２３の一端のエンドプレート２２にボルト３６で締結された配管３０、３１内に形成されスタック２３内のマニホールド２８、２９に連通する流体流路３５と、からなる燃料電池のマニホールドにおいて、スタック２３内のマニホールド２８、２９のうち、スタック一端のエンドプレート２２にあるマニホールド部分は、セル積層方向に対して斜めに延びている。エンドプレート２２内マニホールド部分は、マニホールド軸芯が斜めに延びていればよく、図５の（Ａ）に示すようにマニホールド軸芯を挟んでマニホールド両側壁面が平行に斜めに延びている場合を含む他、図５の（Ａ’）に示すように、マニホールド軸芯を挟んだマニホールド両側壁面のうち一方の側壁面がセル積層方向に延び他方の側壁面が斜めに（セル積層方向外側にいくほどエンドプレート中央に近づく方向）延びている場合も含む。

【００１４】配管３０、３１のフランジ３４部分の流体流路３５の中心は、スタック２３のセル積層体部分のマニホールド２８、２９の中心に対してセル積層方向と直交する方向にスタック中心側に（エンドプレート端部から離れる方向に）オフセットしている。スタック一端のエンドプレート２２内でセル積層方向に対して斜めに延びるマニホールド部分は、スタック一端のエンドプレート２２の左右方向端部にあるマニホールド部分である。したがって、２スタックを並列配置したスタックの一端部に左右スタックに対して共通に設けられる単一のエンドプレート２２においては、エンドプレートの左右方向中央部側に設けられるマニホールド部分は、斜めに延びる必要はない。

【００１５】配管３０、３１のフランジ３４には、ボルト穴３８が形成されるとともに、Ｏリング溝３９が形成され、Ｏリング溝３９にはＯリング３７が配されて、配管３０、３１とフランジ３４との合わせ部をシールしている。フランジ３４、ボルト穴３８、Ｏリング溝３９、Ｏリング３７のそれぞれの大きさとそれぞれの間の間隔は、図５の（Ｂ）の比較例（斜めに延びるマニホールドがない）に示した、シール性および強度上必要な大きさおよび間隔と等しいかまたはそれより大である。その場合、図５の（Ｂ）の比較例では、フランジ端部がセル積層体の端部より外側にくるが、図５の（Ａ）、（Ａ’）の本発明実施例では、フランジ端部がほぼセル積層体の端部の位置にくる。

【００１６】また、図６、図７に示すように、配管３０、３１のスタック２３への接続部で、アノードガスと他の流体とで、Ｏリング３７で構成されるシールライン（Ｏリング溝３９ライン）は互いに独立であるが、Ｏリング３７を押さえる配管フランジ３４は互いに共通にしてある。フランジ３４の共通としたことにより、アノードガスのマニホールドとそれと隣接するマニホールドとの間にあるボルト４０は、図４に示した４本から図７に示すように２本としてもよい。ボルト２本とした場合は、ボルト４本に比べて更なる省スペース化がはかられ、配管取付け構造が簡素化される。

【００１７】つぎに、本発明実施例の燃料電池のマニホールドの作用を説明する。まず、スタック２３内のマニホールド２８、２９のうち、スタック一端のエンドプレート２２内のマニホールド部分は、セル積層方向に対して斜めに延びているので、セル積層体部位のマニホールドの配置は従来のままにして、エンドプレート２２内マニホールド２８、２９部分と配管内流路３５との接続部

Pをセル積層体部位のマニホールドに対してセル積層方向と直交する方向にオフセット（位置をずらす）させることができ、エンドプレート２２内マニホールド部分と配管内流路３５との接続部Pとエンドプレート２２のセル積層方向と直交する方向の端部Qとの間に、図５の比較例Bの場合（エンドプレート内マニホールドが斜めに延びていない場合）よりも大きなスペースを確保することができ、その部分にフランジ３４部分やOリング３７部分を小型化することなく容易に配設することができる。したがって、省スペース化を達成できるとともに、十分なシール性を確保することができる。

【００１８】オフセットされる場合、配管３０、３１のフランジ３４部分の流体流路３５の中心Pが、スタック２３のセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしているので、エンドプレート２２内マニホールド部分と配管内流路３５との接続部Pとエンドプレート２２のセル積層方向と直交する方向の端部Qとの間に、図５の比較例Bの場合（エンドプレート内マニホールドが斜めに延びていない場合）よりも大きなスペースを確保することができ、その部分にフランジ３４部分やOリング３７部分を配設することが無理なく可能となる。したがって、省スペース化とシール性の確保が共に達成される。

【００１９】また、図６、図７の燃料電池のマニホールドでは、配管３０、３１のスタック２３への接続部で、アノードガスと他の流体とで、Oリング３７で構成されるシールラインが互いに独立とされているため、Oリング３７を通しての、水素ガスの他の流体のマニホールドへの透過を防ぐことができる。また、Oリング３７を押さえる配管フランジ３４を互いに共通にしたので、フランジ部、シール部が省スペース化される。

【００２０】

【発明の効果】請求項１の燃料電池のマニホールドによれば、スタック内のマニホールドのうち、スタック一端のエンドプレート内のマニホールド部分が、セル積層方向に対して斜めに延びているので、セル積層体部位のマニホールドの配置は従来のまま、エンドプレート内マニホールド部分と配管内流路との接続部をセル積層体部位のマニホールドに対してセル積層方向と直交する方向にオフセットさせることができる。その結果、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やOリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。請求項２の燃料電池のマニホールドによれば、配管のフランジ部分の流体流路の中心が、スタックのセル積層体部分のマニホールドの中心に対してセル積層方向と直交する方向にスタック中心側にオフセットしているので、エンドプレート内マニホールド部分と配管内流路との接続部とエンドプレートのセル積層方向と直交する方向の端部との間に、従来よりも大きなスペースを確保することができ、その部分にフランジ部分やOリング部分を小型化することなく容易に配設することができる。したがって、省スペース化とシール性の確保を共に達成することができる。請求項３の燃料電池のマニホールドによれば、配管のスタックへの接続部で、アノードガスと他の流体とで、Oリングで構成されるシールラインは互いに独立とするが、Oリングを押さえる配管フランジは互いに共通にしたので、Oリングを通しての他流体の流路ラインへのアノードガスの透過防止を確保したまま、フランジを共有化することでフランジ部、シール部を省スペース化できる。

【図面の簡単な説明】

【図１】本発明の燃料電池のマニホールドが適用された燃料電池の側面図である。

【図２】図１の燃料電池の一部分の拡大断面図である。

【図３】本発明の燃料電池のマニホールドが適用された燃料電池の斜視図である。

【図４】図３の燃料電池の、配管が取付けられる側のエンドプレート側から見た正面図である。

【図５】図４の燃料電池の、（Ａ）Ａ－Ａ線に沿う断面図（本発明）、（Ａ'）本発明に含むもう一つの例、および（Ｂ）比較例（比較例は本発明に含まず）の断面図である。

【図６】本発明の燃料電池のマニホールドが適用された燃料電池の斜視図である。

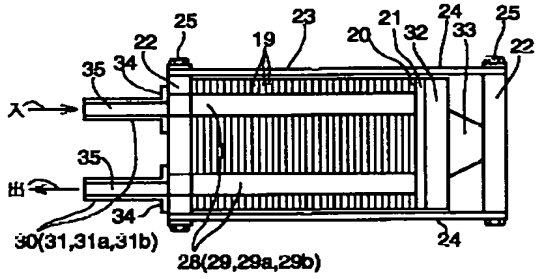
【図７】図６の燃料電池の一端のエンドプレート部とそれに取り付けられる配管のフランジの一部の斜視図である。

【符号の説明】

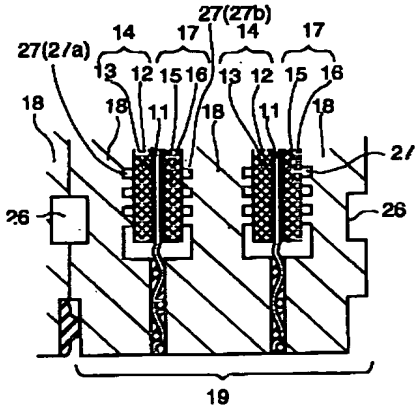
１０　（固体高分子電解質型）燃料電池
１１　電解質膜
１２　触媒層
１３　拡散層
１４　電極（アノード、燃料極）
１５　触媒層
１６　拡散層
１７　電極（カソード、空気極）
１８　セパレータ
１９　モジュール
２０　ターミナル
２１　インシュレータ
２２　エンドプレート
２３　スタック
２４　テンションプレート
２５　ボルト
２６　冷媒流路

２７　ガス流路
２７ａ　燃料ガス流路
２７ｂ　酸化ガス流路
２８　冷媒マニホールド
２９　ガスマニホールド
２９ａ　燃料ガスマニホールド
２９ｂ　酸化ガスマニホールド
３０　冷媒配管
３１　ガス配管
３１ａ　燃料ガス配管
３１ｂ　酸化ガス配管
３２　プレッシャプレート
３３　ばね機構
３４　フランジ
３５　配管内の流体流路
３６　ボルト
３７　Ｏリング
３８　ボルト穴
３９　Ｏリング溝

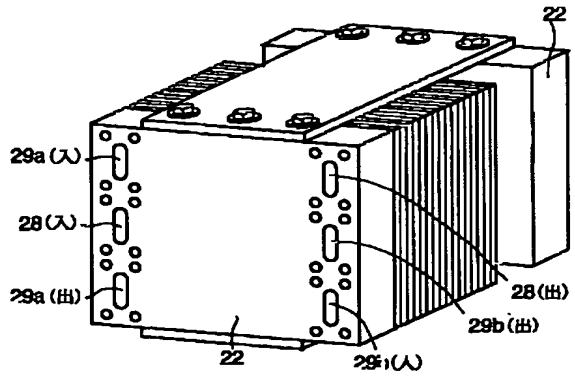
【図１】



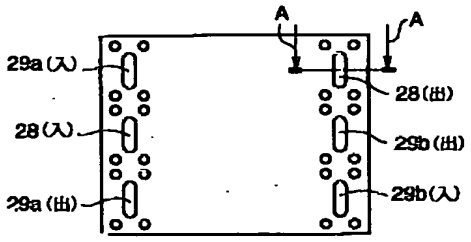
【図２】



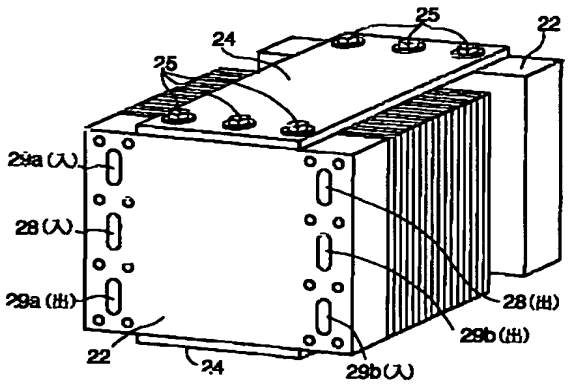
【図３】



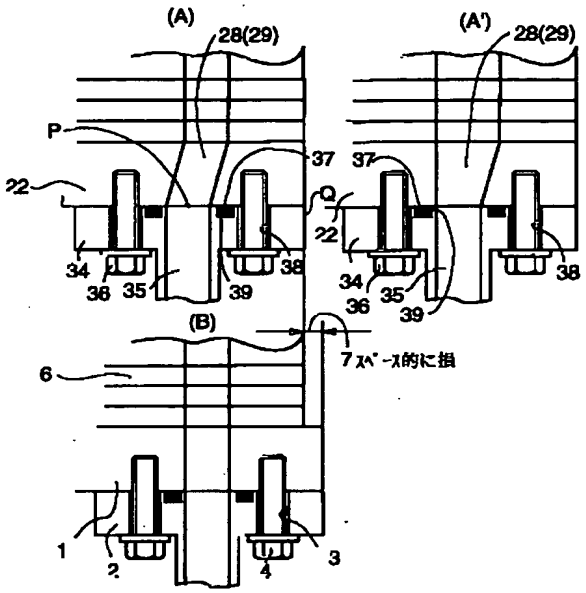
【図４】



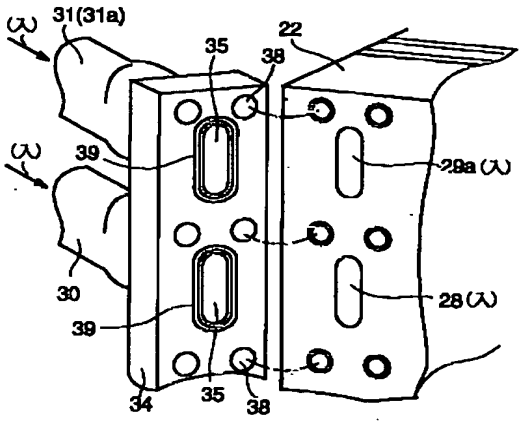
【図６】



【図5】


(A)
28(29)
(A')
28(29)
P
22
37
37
Q
22
34
36
35
38
39
34
36
35
39
38
(B)
7スペース的に狭
6
1
2
4
3

【図7】


31(31a)
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29a(入)
30
28(入)
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38

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-343406
(43)Date of publication of application : 29.11.2002

(51)Int.Cl. H01M 8/24
H01M 8/10

(21)Application number : 2001-146634
(22)Date of filing : 16.05.2001

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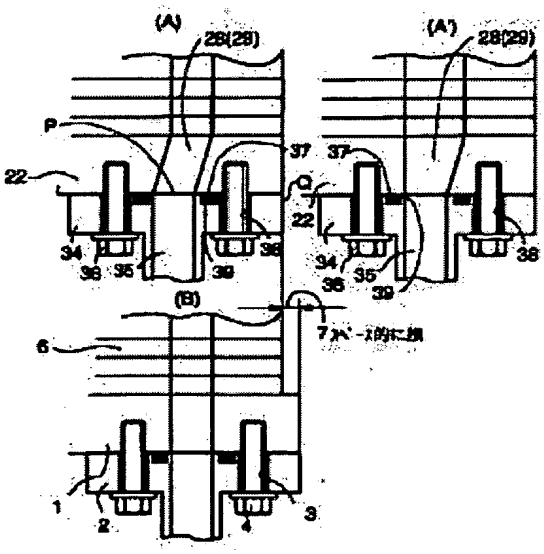
KONSAGA TORU

(54) MANIFOLD FOR FUEL CELL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a manifold for fuel cell capable of attaining both space saving and sealing property.
SOLUTION: (1) This manifold for fuel cell comprises fluid manifolds 28 and 29, formed into a stack 23 constituted with end plates 22 arranged on both ends of a cell laminate, and a fluid passage 35 formed in pipes 30 and 31, having a flange 34 and bolted to the end plate 22 at one end of the stack 23 in the flange part, the fluid passage communicating with the manifold within the stack. Of the manifolds 28 and 29 inside the stack, the manifold part within the end plate 22 at one end of the stack is extended obliquely with respect to the cell laminating direction. (2) In the manifold for fuel cell, although the seal line formed by an O-ring is set mutually independent between anode gas and the other fluid, the pipe flange 34 for pressing the O-ring is mutually shared.



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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]A manifold of a fuel cell with which it is a manifold of a fuel cell and a manifold part in an end plate of said stack end is aslant prolonged to a cell laminating direction among manifolds in said stack characterized by comprising the following.
A manifold of a fluid formed in a stack which arranged and constituted an end plate to both ends of a cell layered product.
A fluid passage which is formed in piping by which has a flange and the bolting join was carried out to an end plate of an end of said stack by this flange, and is open for free passage to a manifold in said stack.

[Claim 2]A manifold of the fuel cell according to claim 1 which has offset the center of a fluid passage of a flange part of said piping at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of said stack.
[Claim 3]A manifold of the fuel cell according to claim 1 which made mutual a piping flange which presses down said O ring in common although a seal line which comprises anode gas and other fluids with an O ring in a terminal area to said stack of said piping is mutually-independent.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to the terminal area of the manifold in a fuel cell stack, and the channel in piping besides a stack, and the structure of the neighborhood about the manifold of a fuel cell.
[0002]
[Description of the Prior Art]the electrode (an anode.) which consists of the catalyst bed and diffusion zone which have been arranged at the whole surface of the electrolyte membrane which a solid polyelectrolyte type fuel cell becomes from an ion-exchange membrane, and this electrolyte membrane with the film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of an electrode (a cathode, an air pole) which consists of the catalyst bed and diffusion zone of a fuel electrode and an electrolyte membrane which were alike on the other hand and have been arranged. an anode and a cathode -- fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) A cell is constituted from a separator which forms oxygen and the fluid channel for usually supplying air, Laminate two or more cells, consider it as a module, laminate a module, and a module group is constituted, A terminal, an insulator, and an end plate are arranged to the cell laminating direction both ends of a module group, and a stack is constituted, and a stack is bound tight in the fastening member (for example, tension plate) prolonged in a cell layered product laminating direction on the outside of a stack, and it consists of what was fixed. In a solid polyelectrolyte type fuel cell, hydrogen is used as a hydrogen ion and an electron by the anode side, a hydrogen ion moves the inside of an electrolyte membrane to the cathode side, and water is generated by the cathode side from oxygen, a hydrogen ion, and an electron (the electron generated with the anode of the next MEA lets a separator pass). anode side: -- H_2 __ ->$2H^+$+$2e^-$ cathode side:, in order to cool the heat which comes out by the water generation reaction in $2H^+$+$2e^-$ +(1/2) O_2->H_2O Joule heat and a cathode, between separators -- every cell -- or the channel through which a cooling medium (usually cooling water) flows is formed for two or more cells of every.
The fuel cell is cooled.
Fluids, such as fuel gas, oxidizing gas, and a refrigerant, are supplied and discharged by the manifold with which the fluid in a stack flows through piping besides a stack so that the above-mentioned reaction may be performed normally. The patent No. 3050408 is indicating the attachment to the fuel cell stack of piping stack outside, and the connection structure to the manifold in a stack.
[0003]
[Problem(s) to be Solved by the Invention]However, in the connection structure to the manifold in a fuel cell stack of piping outside [stack] the patent No. 3050408. Since the manifold in a stack containing the manifold in an end plate and piping stack outside are straight prolonged in a terminal area and its neighborhood, If a flange tends to be provided in piping stack outside and it is going to carry out the bolting join of the piping stack outside to the end plate of a stack, As shown in the comparative example shown in the B section of drawing 5, the size of the end plate

1 which needs to form the bolt hole 3, Compared with the portion of the cell layered product 6 in which a bolt hole is not provided, it becomes large unnecessarily in a cell laminating direction and direction crossing at a right angle for space 7 minutes which forms the bolt hole 3, and futility (disadvantage) arises in space. If the space which tries to achieve space-saving-ization and O ring 5 and the bolt 4 of the flange 2 are made small and in which an O ring and a bolt are formed is made small, the sealing nature in a piping flange part falls, or piping erection intensity runs short. Therefore, it was difficult to attain both space-saving-izing and sealing nature both with structure conventionally. The purpose of this invention is to provide the manifold of the fuel cell which can attain both space-saving-izing and sealing nature both.

[0004]

[Means for Solving the Problem]This invention which attains the above-mentioned purpose is as follows.

(1) A manifold of a fluid formed in a stack which arranged and constituted an end plate to both ends of a cell layered product, A fluid passage which is formed in piping by which has a flange and the bolting join was carried out to an end plate of an end of said stack by this flange, and is open for free passage to a manifold in said stack, A manifold of a fuel cell with which it is a manifold of a fuel cell, ** and others, and a manifold part in an end plate of said stack end is aslant prolonged to a cell laminating direction among manifolds in said stack.

(2) A manifold of a fuel cell given in (1) which has offset the center of a fluid passage of a flange part of said piping at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of said stack.

(3) said -- piping -- said -- a stack -- a terminal area -- anode gas -- others -- a fluid -- an O ring -- constituting -- having -- a seal line -- being mutually-independent -- carrying out -- although -- said -- an O ring -- pressing down -- a piping flange -- mutual -- community -- having carried out -- (-- one --) -- a description -- a fuel cell -- a manifold .

[0005]In a manifold of a fuel cell of the above (1), a manifold part in an end plate of said stack end among manifolds in a stack, Since it has extended aslant to a cell laminating direction, with the former [arrangement / of a manifold of a cell layered product part], A terminal area of a manifold part in an end plate and a channel in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to a manifold of a cell layered product part, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of a fluid passage of a flange part of piping has offset in a manifold of a fuel cell of the above (2) at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of a stack, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Although it supposes that a seal line which comprises anode gas and other fluids with an O ring in a terminal area to a stack of piping is mutually-independent in a manifold of a fuel cell of the above (3), -izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing prevention from a penetration of anode gas to a channel line of other fluids which let an O ring pass, since a piping flange which presses down an O ring was made mutual in common.

[0006]

[Embodiment of the Invention]Below, the fuel cell of this invention is explained with reference to drawing 1 - drawing 7. The fuel cell 10 of this invention is a solid polyelectrolyte type fuel cell. The fuel cell 10 of this invention is carried, for example in a fuel cell electric vehicle. However, it may be used in addition to a car.

[0007]the electrode 14 (an anode.) which consists of the catalyst bed 12 and the diffusion zone

13 which have been arranged at the whole surface of the electrolyte membrane 11 which consists of ion-exchange membranes, and this electrolyte membrane 11 as the solid polyelectrolyte type fuel cell 10 is shown in drawing 1 and drawing 2the electrode 17 (a cathode.) which consists of the catalyst bed 15 and the diffusion zone 16 of a fuel electrode and the electrolyte membrane 11 which were alike on the other hand and have been arranged The film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of air poles, the electrodes 14 and 17 — fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) oxygen and the fluid channel 27 (the fuel gas flow route 27A.) for usually supplying air A cell is formed for the separator 18 which forms the refrigerant passage (circulating-water-flow way) 26 through which the refrigerant the oxidizing gas passage 27B and for fuel cell cooling (cooling water) flows in piles, Carry out the plural laminates of this cell, consider it as the module 19, laminate the module 19, and a module group is constituted, The fastening member 24 (for example) which arranges the terminal 20, the insulator 21, and the end plate 22, constitutes the stack 23, binds the stack 23 tight to a laminating direction, and is prolonged on the outside of a cell layered product to the cell laminating direction both ends of module 19 group in a fuel cell layered product laminating direction A tension plate and a tension plate consist of what was fixed with the part and the bolt 25 of the stack 23. The refrigerant passage 26 is formed for every cell or two or more cells of every. For example, the one refrigerant passage 26 is formed every two cells.

[0008]The separator 18 forms the electric passage through which an electron flows into a cathode from the anode of an adjacent cell while separating mutually any of fuel gas, oxidizing gas and fuel gas, cooling water and oxidizing gas, and cooling water ** they are. That by which the separator 18 formed the refrigerant passage 26 and the gas passageway 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in the carbon plate, Or it consists of either a thing which piled up two or more metal plates with the unevenness which forms the channels 26 and 27, or what [formed the refrigerant passage 26 and the gas passageway 27 in the resin board made from electric conduction (for example, resin board which mixed conducting material particles and gave conductivity)] **. The example of a graphic display shows the case where the separator 18 consists of carbon plates. The gas passagewaies 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in a cell may be any of surface state channel ** between the group of one grooved channel or two or more parallel grooved channels, or the board of the couple separated by two or more projections.

[0009]As shown in drawing 3, drawing 5, and drawing 6, the refrigerant manifold 28 is formed in the fuel cell stack 23, and the refrigerant manifold 28 is open for free passage to the refrigerant passage 26 of a cell. A refrigerant flows into the refrigerant passage 26 from the refrigerant manifold 28 by the side of ON, and flows into the refrigerant manifold 28 by the side of appearance from the refrigerant passage 26. Similarly, the gas manifold 29 is formed in the fuel cell stack 23, and the gas manifold 29 consists of the fuel gas manifold 29a and the oxidation gas manifold 29b. The fuel gas manifold 29a and the oxidation gas manifold 29b are open for free passage to the fuel gas flow route 27a and the oxidizing gas passage 27b of a cell, respectively. Fuel gas flows into the fuel gas flow route 27a of a cell from the fuel gas manifold 29a by the side of ON, and flows into the fuel gas manifold 29a by the side of appearance from the fuel gas flow route 27a. Oxidizing gas flows into the oxidizing gas passage 27b of a cell from the oxidation gas manifold 29b by the side of ON, and flows into the oxidation gas manifold 29b by the side of appearance from the oxidizing gas passage 27b.

[0010]The stack 23 may be arranged at a level with two-row parallel, and the end plate 22 of the both ends of the stack 23 is shared to the stack 23 of two rows in that case. In the end plate 22 in the end of the stack 23. The refrigerant piping 30 supplied and discharged is connected to the refrigerant manifold 28 in the fuel cell stack 23 in the refrigerant (cooling water), and the gas piping 31 which supplies and discharges reactant gas at the gas manifold 29 in a fuel cell stack is connected. The gas piping 31 consists of the fuel gas piping 31a which supplies and discharges fuel gas at the fuel gas manifold 29a in a fuel cell stack, and the oxidizing gas piping 31b which supplies and discharges oxidizing gas at the oxidation gas manifold 29b in a fuel cell stack. A refrigerant, fuel gas, and oxidizing gas enter and make a U-turn to a fuel cell stack from the end

plate 22 in the end of the stack 23, and come out of the same end plate 22.
[0011]In the case of 1 stack fuel cell, a refrigerant (cooling water) goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side refrigerant piping 30, and flows out of the stack 23 into the appearance side refrigerant piping 30 in the upper part of the longitudinal-direction end of the end plate 22. Fuel gas goes into the stack 23 in the upper part of the longitudinal-direction end of the end plate 22 from the ON side fuel gas piping 31a, and flows out of the stack 23 into the appearance side fuel gas piping 31a in the lower part of the longitudinal-direction end of the end plate 22. Oxidizing gas goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side oxidizing gas piping 31b, and flows out of the stack 23 into the appearance side oxidizing gas piping 31b in the upper part of the longitudinal-direction end of the end plate 22. In the case of 2 stack fuel cell, the appearance side fuel gas piping 31a is arranged to a central site, a two and ON side arranges symmetrically 1 stack fuel cell for which the above-mentioned piping configuration is taken, and, as for an end plate, the structure established one in common to the stack on either side is taken.
[0012]The pressure plate 32 is formed inside the end plate 22 in the other end of the stack 23, and the spring mechanism (for example, belleville spring mechanism) 33 which absorbs change of stack clamp load is formed between the pressure plate 32 and the end plate 22. Piping of a refrigerant and reactant gas is not connected to the end-plate 22 side in the other end of the stack 23.
[0013]The manifolds 28 and 29 of the fluid formed in the stack 23 as shown in drawing 3 - drawing 5, The fluid passage 35 which is formed in the piping 30 and 31 which has the flange 34 and was concluded by the end plate 22 of the end of the stack 23 with the bolt 36 by the flange, and is open for free passage to the manifolds 28 and 29 in the stack 23, In the manifold of the fuel cell, ** and others, the manifold part which is in the end plate 22 of a stack end among the manifolds 28 and 29 in the stack 23 is aslant prolonged to the cell laminating direction. As for the manifold part in the end plate 22, the manifold axis should just be prolonged aslant, As shown in (A) of drawing 5, include the case where the manifold each-side-walls side has extended aslant in parallel on both sides of the manifold axis, and also as shown in (A') of drawing 5, It contains, also when one wall surface extends in a cell laminating direction among the manifold each-side-walls sides which sandwiched the manifold axis and the wall surface of another side has extended aslant (direction which approaches in the center of an end plate, so that it goes to the cell laminating direction outside).
[0014]The center of the fluid passage 35 of flange 34 portion of the piping 30 and 31 is offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifolds 28 and 29 of the cell layered product portion of the stack 23 (in direction which separates from an end-plate end). The manifold part aslant prolonged to a cell laminating direction within the end plate 22 of a stack end is a manifold part in the longitudinal-direction end of the end plate 22 of a stack end. Therefore, in the single end plate 22 provided in the end part of the stack which carried out parallel arrangement of the two stacks in common to a right-and-left stack, the manifold part provided in the longitudinal-direction center-section side of the end plate does not need to be prolonged aslant.
[0015]While the bolthole 38 is formed, O ring groove 39 is formed in the flange 34 of the piping 30 and 31, O ring 37 is arranged on O ring groove 39, and the seal of the doubling part of the piping 30 and 31 and the flange 34 is carried out to it. Each size of the flange 34, the bolthole 38, the O link groove 39, and O ring 37 and the interval between each are equal to a required size and interval on the sealing nature and intensity which were shown in the comparative example of (B) of drawing 5 (there is no manifold prolonged aslant), or size from it. In that case, although a flange end part comes by the comparative example of (B) of drawing 5 outside the end of a cell layered product, a flange end part comes to the position of the end of a cell layered product by this invention working example of (A) of drawing 5, and (A') mostly.
[0016]As shown in drawing 6 and drawing 7, the seal line (O ring groove of 39 lines) which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is mutually-independent, but the piping flange 34 which presses down O ring 37

is made mutual in common. By [of the flange 34] having presupposed that it is common, the bolt 40 between the manifolds which adjoin the manifold of anode gas and it is good also as two, as shown in drawing 7 from four were shown in drawing 4. When it is considered as two bolts, the further space-saving-ization is achieved compared with four bolts, and piping erection structure is simplified.

[0017]Below, an operation of the manifold of the fuel cell of this invention working example is explained. First, the manifold part in the end plate 22 of the stack end among the manifolds 28 and 29 in the stack 23, Since it has extended aslant to the cell laminating direction, arrangement of the manifold of a cell layered product part is left the former, The terminal area P of the manifold 28 in the end plate 22, 29 portions, and the channel 35 in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part (a position is shifted), Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 is securable, and it can allocate easily, without miniaturizing flange 34 portion and O ring 37 portion into the portion. Therefore, while being able to attain space-saving-ization, sufficient sealing nature is securable.

[0018]When offset, the center P of the fluid passage 35 of flange 34 portion of the piping 30 and 31. Since it has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of the stack 23, Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 can be secured, and it becomes it is reasonable and possible to allocate flange 34 portion and O ring 37 portion in the portion. Therefore, both space-saving-izing and sealing nature reservation are attained.

[0019]In the manifold of the fuel cell of drawing 6 and drawing 7. Since the seal line which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is made mutually-independent, the penetration to the manifold of other fluids of hydrogen gas which let O ring 37 pass can be prevented. Since the piping flange 34 which presses down O ring 37 was made mutual in common, a flange and a seal part are made space-saving.

[0020]

[Effect of the Invention]Since the manifold part in the end plate of a stack end is aslant prolonged to the cell laminating direction among the manifolds in a stack according to the manifold of the fuel cell of Claim 1, The arrangement of the manifold of a cell layered product part can make the terminal area of the manifold part in an end plate, and the channel in piping offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part in the conventional state. As a result, between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, A bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of the fluid passage of the flange part of piping has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of a stack according to the manifold of the fuel cell of Claim 2, Between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Although [according to the manifold of the fuel cell of Claim 3] the seal line which comprises

anode gas and other fluids with an O ring in the terminal area to the stack of piping is mutually-independent, -izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing the prevention from a penetration of the anode gas to the channel line of the other fluids which let an O ring pass, since the piping flange which presses down an O ring was made mutual in common.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]Especially this invention relates to the terminal area of the manifold in a fuel cell stack, and the channel in piping besides a stack, and the structure of the neighborhood about the manifold of a fuel cell.

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PRIOR ART

[Description of the Prior Art]the electrode (an anode.) which consists of the catalyst bed and diffusion zone which have been arranged at the whole surface of the electrolyte membrane which a solid polyelectrolyte type fuel cell becomes from an ion-exchange membrane, and this electrolyte membrane with the film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of an electrode (a cathode, an air pole) which consists of the catalyst bed and diffusion zone of a fuel electrode and an electrolyte membrane which were alike on the other hand and have been arranged. an anode and a cathode -- fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) A cell is constituted from a separator which forms oxygen and the fluid channel for usually supplying air, Laminate two or more cells, consider it as a module, laminate a module, and a module group is constituted, A terminal, an insulator, and an end plate are arranged to the cell laminating direction both ends of a module group, and a stack is constituted, and a stack is bound tight in the fastening member (for example, tension plate) prolonged in a cell layered product laminating direction on the outside of a stack, and it consists of what was fixed. In a solid polyelectrolyte type fuel cell, hydrogen is used as a hydrogen ion and an electron by the anode side, a hydrogen ion moves the inside of an electrolyte membrane to the cathode side, and water is generated by the cathode side from oxygen, a hydrogen ion, and an electron (the electron generated with the anode of the next MEA lets a separator pass). anode side: -- H_2 __ ->$2H^+$+$2e^-$ cathode side:, in order to cool the heat which comes out by the water generation reaction in $2H^+$+$2e^-$ +(1/2) O_2->H_2O Joule heat and a cathode, between separators -- every cell -- or the channel through which a cooling medium (usually cooling water) flows is formed for two or more cells of every.
The fuel cell is cooled.
Fluids, such as fuel gas, oxidizing gas, and a refrigerant, are supplied and discharged by the manifold with which the fluid in a stack flows through piping besides a stack so that the above-mentioned reaction may be performed normally. The patent No. 3050408 is indicating the attachment to the fuel cell stack of piping stack outside, and the connection structure to the manifold in a stack.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]Since the manifold part in the end plate of a stack end is aslant prolonged to the cell laminating direction among the manifolds in a stack according to the manifold of the fuel cell of Claim 1, The arrangement of the manifold of a cell layered product part can make the terminal area of the manifold part in an end plate, and the channel in piping offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part in the conventional state. As a result, between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, A bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of the fluid passage of the flange part of piping has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of a stack according to the manifold of the fuel cell of Claim 2, Between the ends of the direction which intersects perpendicularly with the terminal area of the manifold part in an end plate, and the channel in piping, and the cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Although [according to the manifold of the fuel cell of Claim 3] the seal line which comprises anode gas and other fluids with an O ring in the terminal area to the stack of piping is mutually-independent, -izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing the prevention from a penetration of the anode gas to the channel line of the other fluids which let an O ring pass, since the piping flange which presses down an O ring was made mutual in common.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the connection structure to the manifold in a fuel cell stack of piping outside [stack] the patent No. 3050408. Since the manifold in a stack containing the manifold in an end plate and piping stack outside are straight prolonged in a terminal area and its neighborhood, If a flange tends to be provided in piping stack outside and it is going to carry out the bolting join of the piping stack outside to the end plate of a stack, As shown in the comparative example shown in the B section of drawing 5, the size of the end plate 1 which needs to form the bolt hole 3, Compared with the portion of the cell layered product 6 in which a bolt hole is not provided, it becomes large unnecessarily in a cell laminating direction and direction crossing at a right angle for space 7 minutes which forms the bolt hole 3, and futility (disadvantage) arises in space. If the space which tries to achieve space-saving-ization and O ring 5 and the bolt 4 of the flange 2 are made small and in which an O ring and a bolt are formed is made small, the sealing nature in a piping flange part falls, or piping erection intensity runs short. Therefore, it was difficult to attain both space-saving-izing and sealing nature both with structure conventionally. The purpose of this invention is to provide the manifold of the fuel cell which can attain both space-saving-izing and sealing nature both.

[Translation done.]

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MEANS

[Means for Solving the Problem]This invention which attains the above-mentioned purpose is as follows.
(1) A manifold of a fluid formed in a stack which arranged and constituted an end plate to both ends of a cell layered product, A fluid passage which is formed in piping by which has a flange and the bolting join was carried out to an end plate of an end of said stack by this flange, and is open for free passage to a manifold in said stack, A manifold of a fuel cell with which it is a manifold of a fuel cell, ** and others, and a manifold part in an end plate of said stack end is aslant prolonged to a cell laminating direction among manifolds in said stack.
(2) A manifold of a fuel cell given in (1) which has offset the center of a fluid passage of a flange part of said piping at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of said stack.
(3) said -- piping -- said -- a stack -- a terminal area -- anode gas -- others -- a fluid -- an O ring -- constituting -- having -- a seal line -- being mutually-independent -- carrying out -- although -- said -- an O ring -- pressing down -- a piping flange -- mutual -- community -- having carried out -- (-- one --) -- a description -- a fuel cell -- a manifold .
[0005]In a manifold of a fuel cell of the above (1), a manifold part in an end plate of said stack end among manifolds in a stack, Since it has extended aslant to a cell laminating direction, with the former [arrangement / of a manifold of a cell layered product part], A terminal area of a manifold part in an end plate and a channel in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to a manifold of a cell layered product part, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Since the center of a fluid passage of a flange part of piping has offset in a manifold of a fuel cell of the above (2) at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of a manifold of a cell layered product portion of a stack, Between ends of a direction which intersects perpendicularly with a terminal area of a manifold part in an end plate, and a channel in piping, and a cell laminating direction of an end plate, a bigger space than before is securable, and it can allocate easily, without miniaturizing a flange part and an O ring portion into the portion. Therefore, both space-saving-izing and sealing nature reservation can be attained. Although it supposes that a seal line which comprises anode gas and other fluids with an O ring in a terminal area to a stack of piping is mutually-independent in a manifold of a fuel cell of the above (3), -izing of a flange and the seal part can be carried out [space-saving] by sharing a flange, securing prevention from a penetration of anode gas to a channel line of other fluids which let an O ring pass, since a piping flange which presses down an O ring was made mutual in common.
[0006]
[Embodiment of the Invention]Below, the fuel cell of this invention is explained with reference to drawing 1 - drawing 7. The fuel cell 10 of this invention is a solid polyelectrolyte type fuel cell.

The fuel cell 10 of this invention is carried, for example in a fuel cell electric vehicle. However, it may be used in addition to a car.
[0007]the electrode 14 (an anode.) which consists of the catalyst bed 12 and the diffusion zone 13 which have been arranged at the whole surface of the electrolyte membrane 11 which consists of ion-exchange membranes, and this electrolyte membrane 11 as the solid polyelectrolyte type fuel cell 10 is shown in drawing 1 and drawing 2the electrode 17 (a cathode.) which consists of the catalyst bed 15 and the diffusion zone 16 of a fuel electrode and the electrolyte membrane 11 which were alike on the other hand and have been arranged The film-electrode assembly (MEA:Membrane-Electrode Assembly) which consists of air poles, the electrodes 14 and 17 -- fuel gas (anode gas, hydrogen) and oxidizing gas (cathode gas.) oxygen and the fluid channel 27 (the fuel gas flow route 27A.) for usually supplying air A cell is formed for the separator 18 which forms the refrigerant passage (circulating-water-flow way) 26 through which the refrigerant the oxidizing gas passage 27B and for fuel cell cooling (cooling water) flows in piles, Carry out the plural laminates of this cell, consider it as the module 19, laminate the module 19, and a module group is constituted, The fastening member 24 (for example) which arranges the terminal 20, the insulator 21, and the end plate 22, constitutes the stack 23, binds the stack 23 tight to a laminating direction, and is prolonged on the outside of a cell layered product to the cell laminating direction both ends of module 19 group in a fuel cell layered product laminating direction A tension plate and a tension plate consist of what was fixed with the part and the bolt 25 of the stack 23. The refrigerant passage 26 is formed for every cell or two or more cells of every. For example, the one refrigerant passage 26 is formed every two cells.
[0008]The separator 18 forms the electric passage through which an electron flows into a cathode from the anode of an adjacent cell while separating mutually any of fuel gas, oxidizing gas and fuel gas, cooling water and oxidizing gas, and cooling water ** they are. That by which the separator 18 formed the refrigerant passage 26 and the gas passageway 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in the carbon plate, Or it consists of either a thing which piled up two or more metal plates with the unevenness which forms the channels 26 and 27, or what [formed the refrigerant passage 26 and the gas passageway 27 in the resin board made from electric conduction (for example, resin board which mixed conducting material particles and gave conductivity)] **. The example of a graphic display shows the case where the separator 18 consists of carbon plates. The gas passagewaies 27 (the fuel gas flow route 27a, the oxidizing gas passage 27b) in a cell may be any of surface state channel ** between the group of one grooved channel or two or more parallel grooved channels, or the board of the couple separated by two or more projections.
[0009]As shown in drawing 3, drawing 5, and drawing 6, the refrigerant manifold 28 is formed in the fuel cell stack 23, and the refrigerant manifold 28 is open for free passage to the refrigerant passage 26 of a cell. A refrigerant flows into the refrigerant passage 26 from the refrigerant manifold 28 by the side of ON, and flows into the refrigerant manifold 28 by the side of appearance from the refrigerant passage 26. Similarly, the gas manifold 29 is formed in the fuel cell stack 23, and the gas manifold 29 consists of the fuel gas manifold 29a and the oxidation gas manifold 29b. The fuel gas manifold 29a and the oxidation gas manifold 29b are open for free passage to the fuel gas flow route 27a and the oxidizing gas passage 27b of a cell, respectively. Fuel gas flows into the fuel gas flow route 27a of a cell from the fuel gas manifold 29a by the side of ON, and flows into the fuel gas manifold 29a by the side of appearance from the fuel gas flow route 27a. Oxidizing gas flows into the oxidizing gas passage 27b of a cell from the oxidation gas manifold 29b by the side of ON, and flows into the oxidation gas manifold 29b by the side of appearance from the oxidizing gas passage 27b.
[0010]The stack 23 may be arranged at a level with two-row parallel, and the end plate 22 of the both ends of the stack 23 is shared to the stack 23 of two rows in that case. In the end plate 22 in the end of the stack 23. The refrigerant piping 30 supplied and discharged is connected to the refrigerant manifold 28 in the fuel cell stack 23 in the refrigerant (cooling water), and the gas piping 31 which supplies and discharges reactant gas at the gas manifold 29 in a fuel cell stack is connected. The gas piping 31 consists of the fuel gas piping 31a which supplies and discharges

fuel gas at the fuel gas manifold 29a in a fuel cell stack, and the oxidizing gas piping 31b which supplies and discharges oxidizing gas at the oxidation gas manifold 29b in a fuel cell stack. A refrigerant, fuel gas, and oxidizing gas enter and make a U-turn to a fuel cell stack from the end plate 22 in the end of the stack 23, and come out of the same end plate 22.

[0011]In the case of 1 stack fuel cell, a refrigerant (cooling water) goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side refrigerant piping 30, and flows out of the stack 23 into the appearance side refrigerant piping 30 in the upper part of the longitudinal-direction end of the end plate 22. Fuel gas goes into the stack 23 in the upper part of the longitudinal-direction end of the end plate 22 from the ON side fuel gas piping 31a, and flows out of the stack 23 into the appearance side fuel gas piping 31a in the lower part of the longitudinal-direction end of the end plate 22. Oxidizing gas goes into the stack 23 in the lower part of the longitudinal-direction end of the end plate 22 from the ON side oxidizing gas piping 31b, and flows out of the stack 23 into the appearance side oxidizing gas piping 31b in the upper part of the longitudinal-direction end of the end plate 22. In the case of 2 stack fuel cell, the appearance side fuel gas piping 31a is arranged to a central site, a two and ON side arranges symmetrically 1 stack fuel cell for which the above-mentioned piping configuration is taken, and, as for an end plate, the structure established one in common to the stack on either side is taken.

[0012]The pressure plate 32 is formed inside the end plate 22 in the other end of the stack 23, and the spring mechanism (for example, belleville spring mechanism) 33 which absorbs change of stack clamp load is formed between the pressure plate 32 and the end plate 22. Piping of a refrigerant and reactant gas is not connected to the end-plate 22 side in the other end of the stack 23.

[0013]The manifolds 28 and 29 of the fluid formed in the stack 23 as shown in drawing 3 - drawing 5, The fluid passage 35 which is formed in the piping 30 and 31 which has the flange 34 and was concluded by the end plate 22 of the end of the stack 23 with the bolt 36 by the flange, and is open for free passage to the manifolds 28 and 29 in the stack 23, In the manifold of the fuel cell, ** and others, the manifold part which is in the end plate 22 of a stack end among the manifolds 28 and 29 in the stack 23 is aslant prolonged to the cell laminating direction. As for the manifold part in the end plate 22, the manifold axis should just be prolonged aslant, As shown in (A) of drawing 5, include the case where the manifold each-side-walls side has extended aslant in parallel on both sides of the manifold axis, and also as shown in (A') of drawing 5, It contains, also when one wall surface extends in a cell laminating direction among the manifold each-side-walls sides which sandwiched the manifold axis and the wall surface of another side has extended aslant (direction which approaches in the center of an end plate, so that it goes to the cell laminating direction outside).

[0014]The center of the fluid passage 35 of flange 34 portion of the piping 30 and 31 is offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifolds 28 and 29 of the cell layered product portion of the stack 23 (in direction which separates from an end-plate end). The manifold part aslant prolonged to a cell laminating direction within the end plate 22 of a stack end is a manifold part in the longitudinal-direction end of the end plate 22 of a stack end. Therefore, in the single end plate 22 provided in the end part of the stack which carried out parallel arrangement of the two stacks in common to a right-and-left stack, the manifold part provided in the longitudinal-direction center-section side of the end plate does not need to be prolonged aslant.

[0015]While the bolthole 38 is formed, O ring groove 39 is formed in the flange 34 of the piping 30 and 31, O ring 37 is arranged on O ring groove 39, and the seal of the doubling part of the piping 30 and 31 and the flange 34 is carried out to it. Each size of the flange 34, the bolthole 38, the O link groove 39, and O ring 37 and the interval between each are equal to a required size and interval on the sealing nature and intensity which were shown in the comparative example of (B) of drawing 5 (there is no manifold prolonged aslant), or size from it. In that case, although a flange end part comes by the comparative example of (B) of drawing 5 outside the end of a cell layered product, a flange end part comes to the position of the end of a cell layered product by this invention working example of (A) of drawing 5, and (A') mostly.

[0016]As shown in drawing 6 and drawing 7, the seal line (O ring groove of 39 lines) which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is mutually-independent, but the piping flange 34 which presses down O ring 37 is made mutual in common. By [of the flange 34] having presupposed that it is common, the bolt 40 between the manifolds which adjoin the manifold of anode gas and it is good also as two, as shown in drawing 7 from four were shown in drawing 4. When it is considered as two bolts, the further space-saving-ization is achieved compared with four bolts, and piping erection structure is simplified.

[0017]Below, an operation of the manifold of the fuel cell of this invention working example is explained. First, the manifold part in the end plate 22 of the stack end among the manifolds 28 and 29 in the stack 23, Since it has extended aslant to the cell laminating direction, arrangement of the manifold of a cell layered product part is left the former, The terminal area P of the manifold 28 in the end plate 22, 29 portions, and the channel 35 in piping can be made to offset in the direction which intersects perpendicularly with a cell laminating direction to the manifold of a cell layered product part (a position is shifted), Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 is securable, and it can allocate easily, without miniaturizing flange 34 portion and O ring 37 portion into the portion. Therefore, while being able to attain space-saving-ization, sufficient sealing nature is securable.

[0018]When offset, the center P of the fluid passage 35 of flange 34 portion of the piping 30 and 31. Since it has offset at the stack center side in the direction which intersects perpendicularly with a cell laminating direction to the center of the manifold of the cell layered product portion of the stack 23, Between the ends Q of the direction which intersects perpendicularly with the terminal area P of the manifold part in the end plate 22, and the channel 35 in piping, and the cell laminating direction of the end plate 22, A bigger (when the manifold in an end plate is not prolonged aslant) space than the case of the comparative example B of drawing 5 can be secured, and it becomes it is reasonable and possible to allocate flange 34 portion and O ring 37 portion in the portion. Therefore, both space-saving-izing and sealing nature reservation are attained.

[0019]In the manifold of the fuel cell of drawing 6 and drawing 7. Since the seal line which comprises anode gas and other fluids with O ring 37 in the terminal area to the stack 23 of the piping 30 and 31 is made mutually-independent, the penetration to the manifold of other fluids of hydrogen gas which let O ring 37 pass can be prevented. Since the piping flange 34 which presses down O ring 37 was made mutual in common, a flange and a seal part are made space-saving.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a side view of the fuel cell with which the manifold of the fuel cell of this invention was applied.
[Drawing 2]They are some expanded sectional views of the fuel cell of drawing 1.
[Drawing 3]It is a perspective view of the fuel cell with which the manifold of the fuel cell of this invention was applied.
[Drawing 4]It is the front view seen from the end-plate side of the side to which piping of the fuel cell of drawing 3 is attached.
[Drawing 5]It is a sectional view of the sectional view (this invention) which meets (A) A-A line of the fuel cell of drawing 4, another example included in this invention (A'), and the (B) comparative example (a comparative example is not included in this invention).
[Drawing 6]It is a perspective view of the fuel cell with which the manifold of the fuel cell of this invention was applied.
[Drawing 7]They are an end plate part of the end of the fuel cell of drawing 6, and some perspective views of the flange of piping attached to it.
[Description of Notations]
10 (Solid polymer electrolyte type) Fuel cell
11 Electrolyte membrane
12 Catalyst bed
13 Diffusion zone
14 Electrode (an anode, a fuel electrode)
15 Catalyst bed
16 Diffusion zone
17 Electrode (a cathode, an air pole)
18 Separator
19 Module
20 Terminal
21 Insulator
22 End plate
23 Stack
24 Tension plate
25 Bolt
26 Refrigerant passage
27 Gas passageway
27a Fuel gas flow route
27b Oxidizing gas passage
28 Refrigerant manifold
29 Gas manifold
29a Fuel gas manifold
29b Oxidation gas manifold
30 Refrigerant piping

31 Gas piping
31a Fuel gas piping
31b Oxidizing gas piping
32 Pressure plate
33 Spring mechanism
34 Flange
35 The fluid passage in piping
36 Bolt
37 O ring
38 Bolthole
39 O ring groove

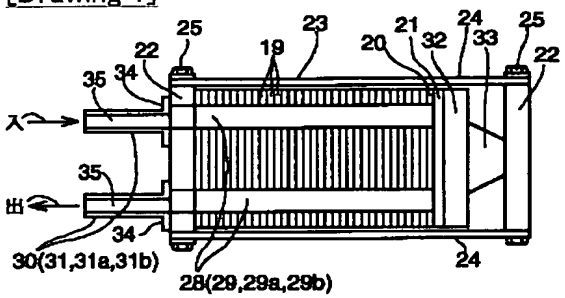
[Translation done.]

* NOTICES *

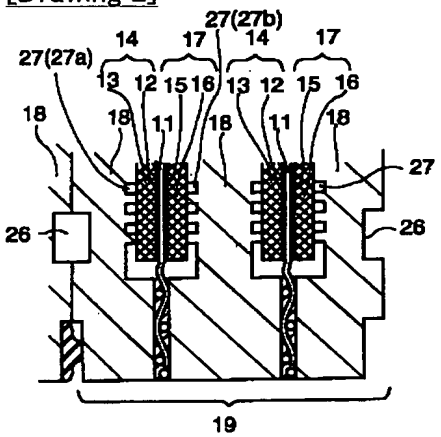
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

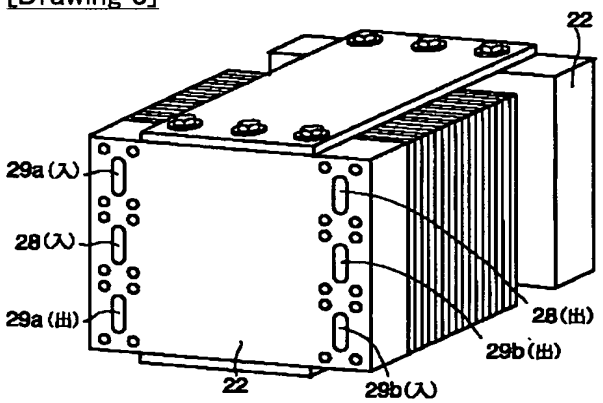
[Drawing 1]



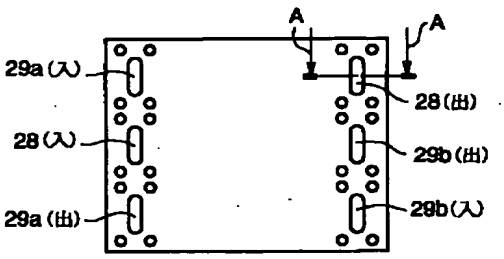
[Drawing 2]



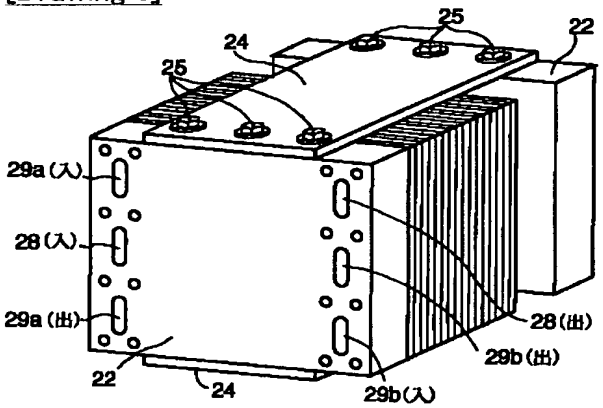
[Drawing 3]



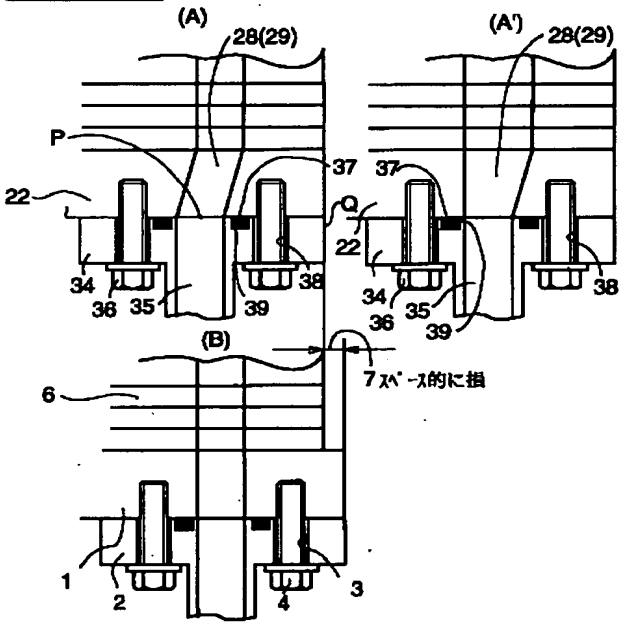
[Drawing 4]



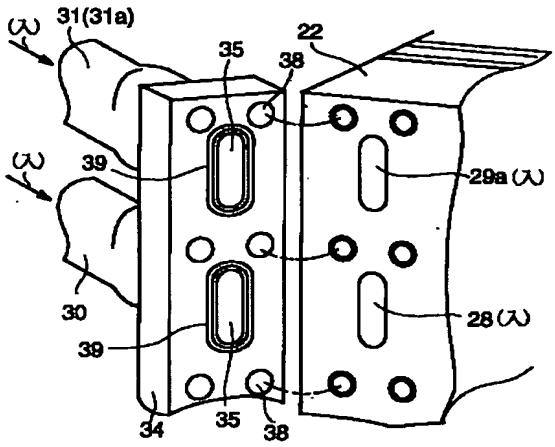
[Drawing 6]



[Drawing 5]



[Drawing 7]



[Translation done.]